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Applicant(s) : ASAHI GOMU KAKO CO., LTD.

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Specification

【Title of the Invention】 MANUFACTURING METHOD AND APPARATUS
OF CUSHION STRUCTURE

【Claims】

1. A manufacturing method of a cushion structure the surface of which is formed with a quadrilateral net rolled up on a quadrilateral frame at each side end portion thereof and stretched on the quadrilateral frame by fastened thereto, wherein the manufacturing method comprises the steps of stretching a quadrilateral net secured at each side end portion thereof to a mounting plate, placing a quadrilateral frame on the net stretched in position and pressing the quadrilateral frame to stretch the new under pressure and to roll up each side end portion of the new on each frame portion of the quadrilateral frame, and fastening the mounting plates to each frame portion of the quadrilateral frame.
2. A manufacturing method of a cushion structure as claimed in claim 1, wherein a rigid frame body is adapted as the quadrilateral frame.
3. A manufacturing method of a cushion structure as claimed in claim 1, wherein the quadrilateral frame is in the form of a combined structure composed of an elastic frame body and a rigid frame body embedded in the elastic frame body, and wherein the mounting plates are respectively fastened to each frame portion of the rigid frame body in a condition where each side end portion of the net was rolled up on each frame portion of the elastic frame body.
4. A manufacturing method of a cushion structure as claimed in claim 1, 2 or 3, comprising the steps of retaining a quadrilateral net on a support frame of a support bed in a flat condition, placing the quadrilateral frame in position on the net retained on the support bed, pressing the quadrilateral frame to roll up each side end portion of the quadrilateral net on each frame portion of the quadrilateral frame, and fastening a mounting plate secured to each side end portion of the net to each frame portion of the quadrilateral frame.
5. A manufacturing apparatus for carrying out the manufacturing method of a cushion structure claimed in claim 1, 2, 3 or 4, comprising a support bed having a quadrilateral frame portion, a plurality of clamping mechanisms mounted on the



support bed for clamping each side end portion of a quadrilateral net placed on the frame portion of the support bed, and a pressure mechanism for pressing a quadrilateral frame onto the net placed on the frame portion of the support bed to roll up each side end portion of the net on each frame portion of the quadrilateral frame.

[Detailed description of the Invention]

[0001]

[Field of the Invention]

The present invention relates to a manufacturing method of a cushion structure and an apparatus for manufacturing the cushion structure.

[0002]

[Prior Art]

In Japanese Patent Laid-open Publication No. 11-290153, there has been proposed a cushion structure the surface of which is formed with a quadrilateral net rolled up on a quadrilateral frame body at each side end portion thereof and stretched on the frame body by adhered thereto. The cushion structure is superior in elastic cushion property in a simple construction since the resiliency of the stretched net is useful to enhance the cushion property of the structure without causing a hardness feeling and a bottomed feeling. Accordingly, the cushion structure can be used as a seat cushion or backrest of various seats.

[0003]

[Problems to be solved]

In the manufacturing process of the cushion structure, a quadrilateral die formed with a quadrilateral groove corresponding with the configuration of the frame is used for setting thereon the quadrilateral net in place. In a condition where the quadrilateral net was set on the die, the quadrilateral frame is coupled with the corresponding quadrilateral groove of the die so that the net is rolled up on the quadrilateral frame at each side end portion thereof and adhered to the frame in place by thermoplastic resin in a melted condition.

[0004]

When the frame is coupled with the corresponding groove of the die, the whole portion of the quadrilateral net except for each side end portion is brought into contact with the surface of the die surrounded by the quadrilateral groove and



restricted in a stretched condition. With such a setting method, it is difficult to uniformly adjust the tension of the quadrilateral net in a desired value.

[0005]

It is, therefore, an object of the present invention to provide a manufacturing method of a cushion structure wherein a net stretched on a frame is superior in cushion property under high tension and wherein the tension of the net can be adjusted in a desired value.

A further object of the present invention is to provide a manufacturing method of a cushion structure superior in cushion property and a manufacturing apparatus of the cushion structure wherein a frame of combined structure composed of an elastic frame body and a rigid frame body embedded in the elastic frame body is adapted as the frame of the cushion structure so that the cushion property of the structure is enhanced by resiliency of a net stretched on the frame and the resiliency of the elastic frame body.

[0007]

[Means for solving the problems]

The present invention is concerned with a manufacturing method and apparatus of a cushion structure having a quadrilateral net rolled up and fastened at each side end portion thereof on each frame portion of a quadrilateral frame.

[0008]

In a first manufacturing method of a cushion structure according to the present invention, a rigid frame body is adapted as the quadrilateral frame, and a net secured at each side end portion thereof with a mounting plate is adapted as the quadrilateral net. The manufacturing method comprises the steps of placing the frame on the net in a stretched condition, pressing the frame in such a manner that the net is stretched under pressure and rolled up at each side end portion thereof on each frame portion of the frame, and fastening the mounting plates of the net to each frame portion of the frame.

[0009]

In a second manufacturing method of a cushion structure according to the present invention, a frame of combined structure composed of an elastic frame body and a rigid frame body embedded in the elastic frame body is adapted as the quadrilateral frame, and a net secured at each side end portion thereof with a mounting

plate is adapted as the quadrilateral net. The manufacturing method comprises the steps of placing the frame on the quadrilateral net in a stretched condition, pressing the frame in such a manner that the net is stretched under pressure and rolled up on each frame portion of the elastic frame body at each side end portion thereof, and fastening the mounting plates to each frame portion of the rigid frame body.

[0010]

In the manufacturing methods described above, the net is supported on a frame of a support bed in a flat condition, the frame is placed on the net and pressed in such a manner that each side end portion of the net are rolled up on each frame portion of the frame, and mounting plates secured to each side end portion of the net are fastened to each frame portion of the frame.

[0011]

A manufacturing apparatus of a cushion structure according to the present invention is adapted to carry out the manufacturing methods described above. The manufacturing apparatus comprises a support bed with a quadrilateral frame, a plurality of clamping mechanisms mounted on the support bed for clamping each side end portion of the net to the quadrilateral frame of the support bed, a plurality of pressure mechanisms mounted on the support bed for pressing a frame body placed on the net in such a manner that each side end portion of the net is rolled up on each frame portion of the frame.

[0012]

[Useful effect of the Invention]

The first manufacturing method is suitable for manufacturing of a cushion structure in which a rigid frame body is adapted as the quadrilateral frame. In the manufacturing method, the net in a stretched condition is stretched under pressure applied from the frame, rolled up at each side end portion thereof on each frame portion of the frame and stretched on the frame by fastening the mounting plates to each frame portion of the frame.

[0013]

With the manufacturing method, the net can be stretched by high tension without any restriction when pressed by the frame, and the tension of the net can be adjusted in a desired value by adjustment of the pressure applied from the frame.

[0014]

The second manufacturing method is suitable for manufacturing of a cushion structure in which a frame of combined structure composed of an elastic frame body and a rigid frame body embedded in the elastic frame body is adapted as the quadrilateral frame. In the manufacturing method, the net in a stretched condition is stretched under pressure applied from the frame, rolled up at each side end portion thereof on each frame portion of the elastic frame body and stretched on the elastic frame body by fastening the mounting plates to each frame portion of the rigid frame body.

[0015]

With the manufacturing method, the net can be accurately rolled up on each frame portion of the elastic frame body at each side end portion thereof without any restriction thereto and stretched by high tension, and the tension of the net can be adjusted in a desired value by adjustment of the pressure applied to the frame.

[0016]

The first and second manufacturing methods according to the present invention can be carried out by an apparatus which comprises a support bed with a quadrilateral frame, a plurality of clamping mechanisms mounted on the support bed for clamping each side end portion of the net to the quadrilateral frame of the support bed, a plurality of pressure mechanisms mounted on the support bed for pressing a frame body placed on the net in such a manner that each side end portion of the net is rolled up on each frame portion of the frame.

[0017]

[Preferred Embodiment]

Illustrated in Figs. 1 and 2 of the drawings is a preferred embodiment of a cushion structure 10 manufactured by the present invention. Fig. 1 is a partly broken perspective view illustrating a bottom of the cushion structure 10, and Fig. 2 is a plan view illustrating the bottom of the cushion structure 10. In the cushion structure 10, a frame of combined structure composed of a rigid frame body embedded in an elastic frame body is used as the frame of the cushion structure.

[0018]

The frame 10a of the cushion structure 10 is in the form of a quadrilateral frame of combined structure composed of a quadrilateral elastic frame body 11 made of sponge and a quadrilateral rigid frame body 12 of metal embedded in the elastic frame body 11. To provide the cushion structure 10, a quadrilateral net 13 made of ultra-strong polyester threads woven in meshes is stretched on the frame 10a.

[0019]

As shown in Figs. 1, 2 and 13, 14, the quadrilateral elastic frame body 11 is formed in a circular cross-section in a condition where it has been assembled in the cushion structure 10. Before assembled in the cushion structure 10, the elastic frame body 11 is formed semi-oval in cross-section as shown in Fig. 12. As shown in Figs. 1 and 3, the rigid square frame body 12 is in the form of a quadrilateral frame of L-letter shape in cross-section and is integrally embedded in the elastic square frame 11 and exposed in a condition where a flat portion 12b of the frame is maintained in contact with a flat portion of the elastic square frame 11.

[0020]

As shown in Figs. 1, 2 and 4, the net is in the form of a quadrilateral net, and a mounting plate 14 is adhered to each side end portion of the quadrilateral net 13 by means of an adhesive agent of thermoplastic resin. For adhesion of the mounting plate 14, an amount of polyester synthetic resin powder is heated at about 260 °C and brought into contact with the mounting plate 14. In a condition where the resin powder is maintained in a melted condition, the mounting plate 14 is placed on each side end portion of the net 13, and the melted resin powder is hardened by cooling under pressure. Thus, the mounting plate 14 is firmly adhered to each side end portion of the net 13.

[0021]

In the cushion structure 10, the quadrilateral net 13 is rolled up at each side end portion thereof on each frame portion 11a of the elastic frame body 11, and the mounting plate 14 is fixed to the flat portion 12b of rigid frame body 12 by means of bolts 15 in a condition where the net 13 is maintained in its rolled up position. In such a condition, each frame portion 11a of the elastic frame body 11 is compressed by each side end portion of quadrilateral net 13 and formed in a circular cross-section. Thus, the net 13 is uniformly stretched on the quadrilateral frame 10a of combined

structure composed of the elastic frame body 11 and rigid frame body 12 and retained in place with a desired tension.

【0022】

In the cushion structure 10, the net 13 is placed at the upper surface of the frame 10a of combined structure in a condition where each side end portion of the net 13 is rolled up on each frame portion 11a of the elastic frame body 11 and fixed to the flat portion 12b of rigid frame body 12 at the bottom surface of the quadrilateral frame 10a. With such a construction, the resiliency of elastic frame body 11 is added to the resiliency of net 13 to enhance the cushion property of the structure 10.

【0023】

As in the cushion structure 10, each side end portion of quadrilateral net 13 is fixed to the flat portion 12b of rigid frame body 12 through each frame portion 11a of elastic frame body 11, the elastic frame body 11 is useful to eliminate a difference in tension of the net 13 and to retain the entirety of net 13 in a uniformly stretched condition. This is useful to provide the cushion structure 10 without causing any local difference in cushion property.

【0024】

The cushion structure 10 with such property can be adapted as a seat cushion or backrest of various seats or as a cushion frame of the seat cushion or backrest. The cushion structure 10 can be manufactured by manufacturing steps shown in Figs. 11 to 14 in use of a manufacturing apparatus 20 shown in Figs. 5, 6 and 10.

【0025】

The manufacturing apparatus 20 is composed of a support bed 21 in the form of a square frame, a pressure bed 22 disposed in the support bed 21, a plurality of clamping mechanisms 23, and a plurality of pressure mechanisms 24. The clamping mechanisms 23 are arranged in a pair and opposed to each other respectively at the left and right sides of support bed 21 and at the front side and backside of outer support bed 21. The pressure mechanisms 24 are arranged at each corner of the support bed 21 and opposed to one another.

【0026】

As shown in Figs. 6 to 9, the clamping mechanisms 23 each are composed of a support bracket 23a, a clamping lever 23b, an operation lever 23c and a connecting

arm 23d. The clamping lever 23b is pivotally mounted at its rear end portion on a front portion of support bracket 23a for rotary movement in a vertical direction. The operation lever 23c is pivotally connected at its front end to the rear end portion of clamping lever 23b for rotary movement in a vertical direction. The connecting arm 23d is pivotally mounted at its rear end on a rear end portion of support bracket 23a for rotary movement in a vertical direction and pivotally connected at its front end to an intermediate portion of operation lever 23c for rotary movement in a vertical direction. The support bracket 23a is mounted on the support bed 21 to place the clamping mechanism 23 in position.

【0027】

When the clamping mechanism 23 is in an inoperative condition, the operation lever 23c is retained in an upward position as shown in Fig. 7 to retain the clamping lever 23b in an upward position. When the operation lever 23c is moved downward to rotate in a clockwise direction, the clamping lever 23b is rotated in a counterclockwise direction and retained in a horizontal condition to be pressed on the pressure bed 22 as shown in Figs. 8 and 9.

【0028】

As shown in Fig. 6, the pressure mechanisms 24 each are substantially the same in construction as the clamping mechanism 23. Namely, the pressure mechanisms 24 each are composed of a support bracket 24a, a pressure lever 24b, an operation lever 24c and a connecting arm 24d. When the operation lever 24c is moved downward, the pressure lever 24b is rotated in a clockwise direction and retained in a horizontal condition to be pressed inside the pressure bed 22.

【0029】

Illustrated in Figs. 11 to 14 is a manufacturing process of the cushion structure 10. In Fig. 10, there is illustrated an inoperative condition of the manufacturing apparatus 20. The manufacturing process of the cushion structure 10 is carried out by the steps of retaining the quadrilateral net 13 on the support bed 22 in a flat condition as shown in Fig. 11, putting the quadrilateral frame 10a of combined structure on the net 13 supported on the support bed 22 as shown in Fig. 12, pressing the quadrilateral frame 10a of combined structure to roll up each side end portion of the quadrilateral net 13 on each frame portion 11a of the elastic frame body 11 as shown in Fig. 13, and fastening each side end portion of the rolled up net 13 to the flat portion 12b of the

rigid frame body 12 as shown in Fig. 14.

[0030]

In use of the manufacturing apparatus 20, a rubber plate 23e for prevention of slippage is attached to each distal end of the clamping lever 23b as shown in Fig. 6, and the manufacturing apparatus 20 is set in an inoperative condition as shown in Fig. 10.

[0031]

At the first step of the manufacturing process, the quadrilateral net 13 is placed on the support bed 22, and each operation lever 23c of the clamping mechanisms 23 is operated to bring the rubber plate 23e attached to the clamping lever 23b into contact with each mounting plate 14 on the net 13. Thus, the net 13 is clamped by the clamping lever 23b at eight portions thereof on the support bed 22 and retained on the support bed 22 in a flat condition as shown in Fig. 11.

[0032]

At the second step of the manufacturing process, the frame 10a composed of the elastic frame body 11 and rigid frame body 12 is placed in position on the quadrilateral net 13 horizontally supported on the support bed 22. At the third step of the manufacturing process, the operation levers 24b of pressure mechanisms 24 are operated to bring the pressure levers 24b into contact with the flat portion 12b of the rigid frame body 12 and to press the frame 10a downward against the net 13. Thus, each frame portion 11a of the quadrilateral frame 11 is compressed into circular in cross-section, and the net 13 is rolled up at each side end portion thereof on the frame 11 and stretched with a predetermined tension. In such operation of the pressure mechanisms 24, it is desirable to mutually operate the pressure mechanisms 24 opposed to each other.

[0033]

At the fourth step of the manufacturing process, the operation levers 23b of clamping mechanisms 23 are successively released from the stretched net 13, and the mounting plate 14 is placed in position on the flat portion 12b of rigid frame body 12 at the released portion of the stretched net 13 and fixed to the rigid frame body 12 by bolts 15. In this instance, it is desirable to release the clamping mechanisms 23 opposed to each other thereby to successively fasten the mounting plate 14 to the rigid

frame body 12 at the released end portion of the stretched net 13.

【0034】

With the manufacturing process described above, the cushion structure 10 is manufactured with the net 13 stretched with a predetermined tension on the elastic frame body 11. In the cushion structure, the resiliency of elastic frame body 11 is added to the resiliency of net 13 to enhance the cushion property of the cushion structure 10 superior in elasticity without causing any local difference in the cushion property.

【0035】

During the manufacturing process, the net 13 retained in place on the support bed 22 is stretched by the quadrilateral frame 10a pressed thereon and rolled up at each side end portion thereof on the elastic frame body 11. Subsequently, the mounting plates 14 are fastened to each frame portion of the rigid frame body 12 to retain the net 13 in the stretched condition.

【0036】

Thus, the net 13 can be accurately rolled up on the elastic frame body 11 at each side end portion thereof without any restriction thereto and stretched on each frame portion 11a of the elastic frame body 11 with high tension, and the tension of the net 13 can be adjusted by the pressure force applied to the frame 10a.

[0037]

Although in the foregoing second manufacturing method, the frame 10a of combined structure composed of the elastic frame body 11 and rigid frame body 12 is adapted to the cushion structure, the first manufacturing method is adapted in the case that only the rigid frame body is adapted to the cushion structure.

[Brief description of the drawings]

Fig. 1 is a partly broken perspective view illustrating a bottom of a cushion structure in accordance with the present invention;

Fig. 2 is a plan view illustrating the bottom of the cushion structure;

Fig. 3 is a partly broken perspective view of a rigid frame body used for the cushion structure;

Fig. 4 is a perspective view of a net used for the cushion structure seen from the front surface ;

Fig. 5 is a plan view of a manufacturing apparatus of the cushion structure;

Fig. 6 is a sectional view taken along line 6 - 6 in Fig. 5;

Fig. 7 is a side view of a clamping mechanism in an inoperative condition of the manufacturing apparatus;

Fig. 8 is a side view of the clamping mechanism in an operated condition;

Fig. 9 is a plan view of the clamping mechanism in an operated condition;

Fig. 10 is a schematic illustration of the manufacturing apparatus in a condition immediately before used for manufacturing the cushion structure;

Fig. 11 is a schematic illustration of an operated condition of the manufacturing apparatus at a first step for manufacturing the cushion structure;

Fig. 12 is a schematic illustration of an operated condition of the manufacturing apparatus at a second step for manufacturing the cushion structure;

Fig. 13 is a schematic illustration of an operated condition of the manufacturing apparatus at a third step for manufacturing the cushion structure; and

Fig. 14 is a schematic illustration of an operated condition of the manufacturing apparatus at a fourth step for manufacturing the cushion structure.

[Description of Reference numerals]

10...Cushion structure, 11...Elastic frame body, 11a...Frame portion, 12...Rigid frame body, 12a...Upright portion, 12b...Flat portion, 13...Net, 14...Mounting plate, 15...Bolt, 20...Manufacturing apparatus, 21...Support bed, 22...Pressure

bed, 23...Clamping mechanism, 23a...Support bracket, 23b...Clamping lever,
23c...Operation lever, 23d...Connecting arm, 24...Pressure mechanism,
24a...Support bracket, 24b...Pressure lever, 24c...Operation lever,
24d...Connecting arm, 24e...Rubber plate.

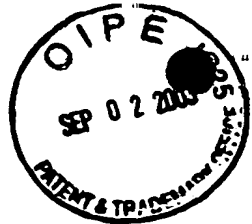


Fig.1

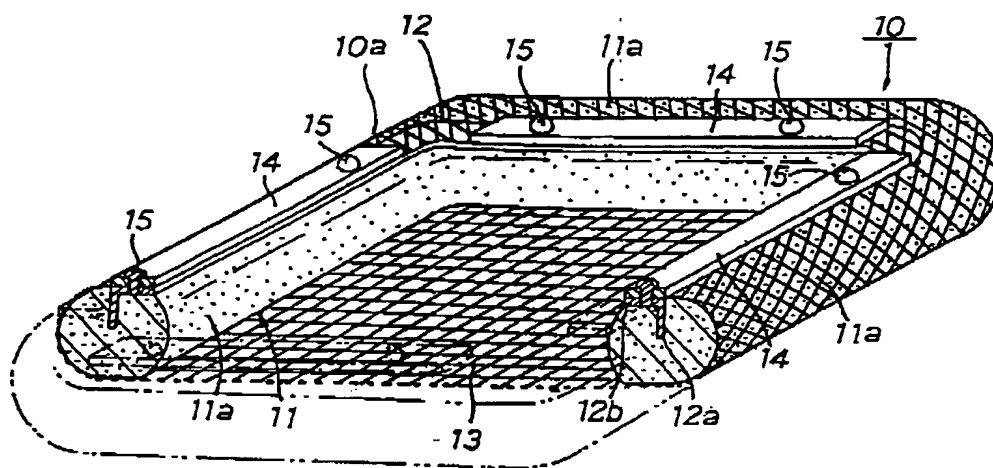




Fig.2

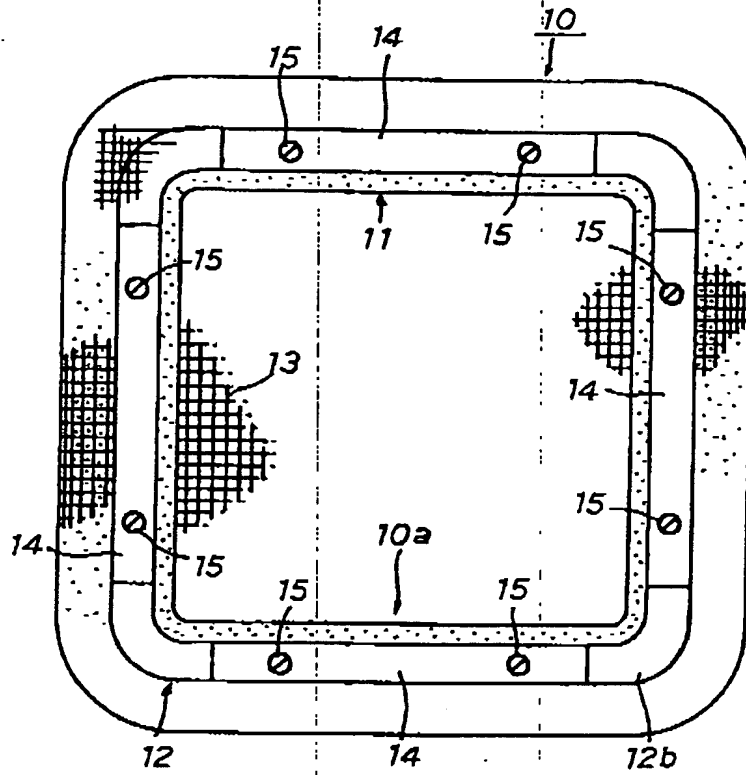




Fig.3

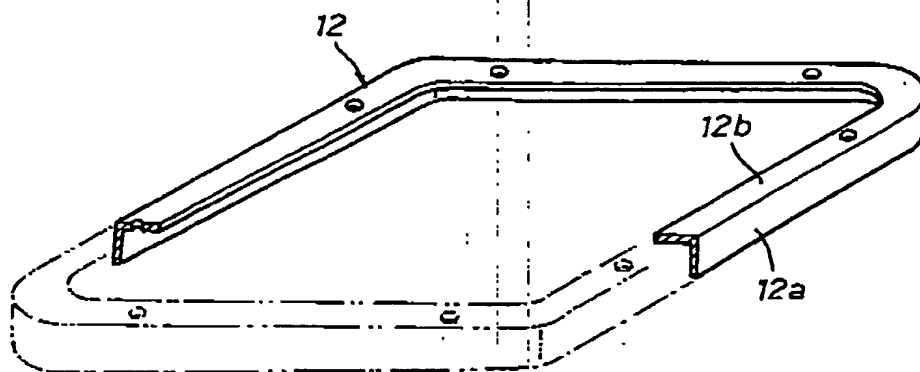




Fig. 4

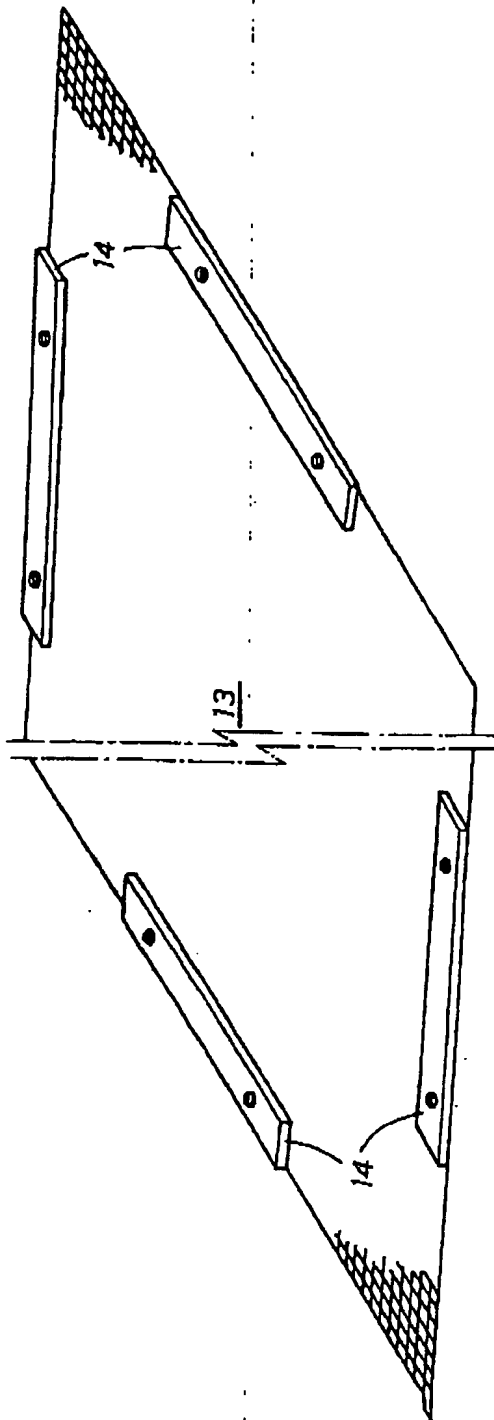


Fig.5

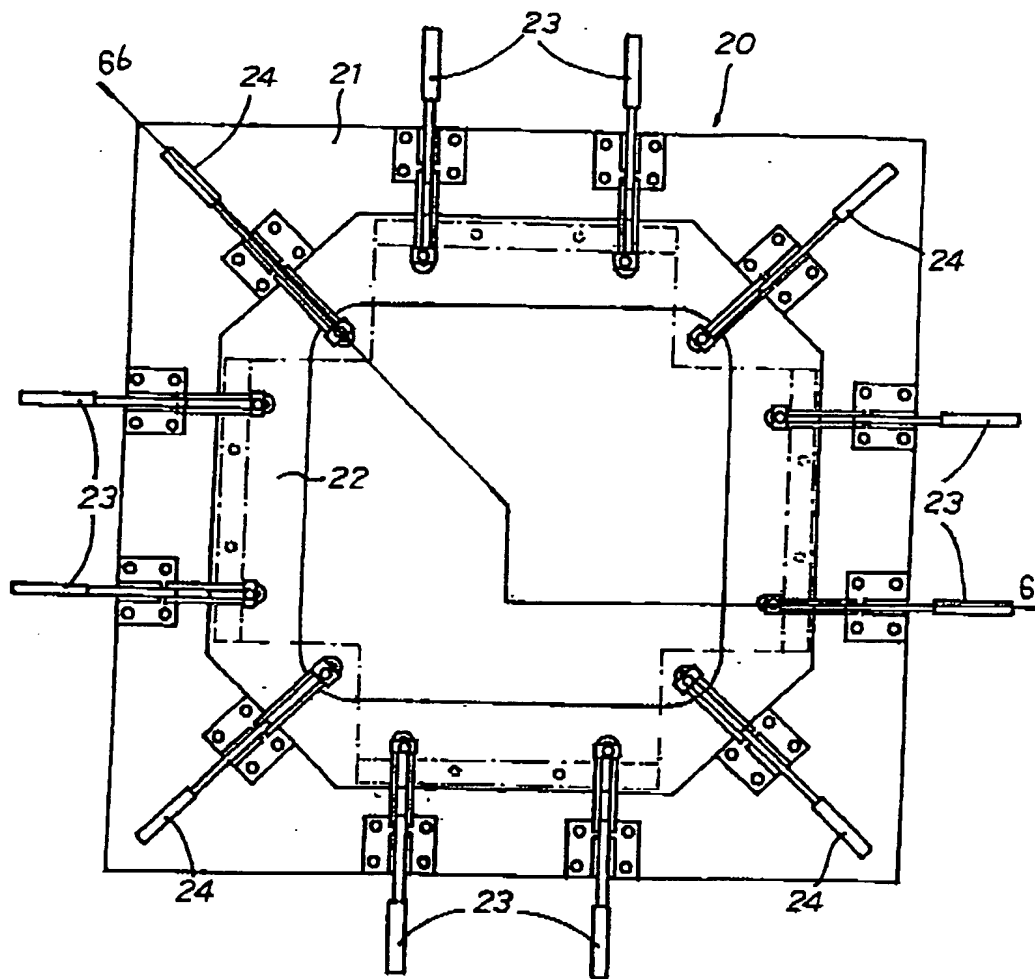




Fig.6

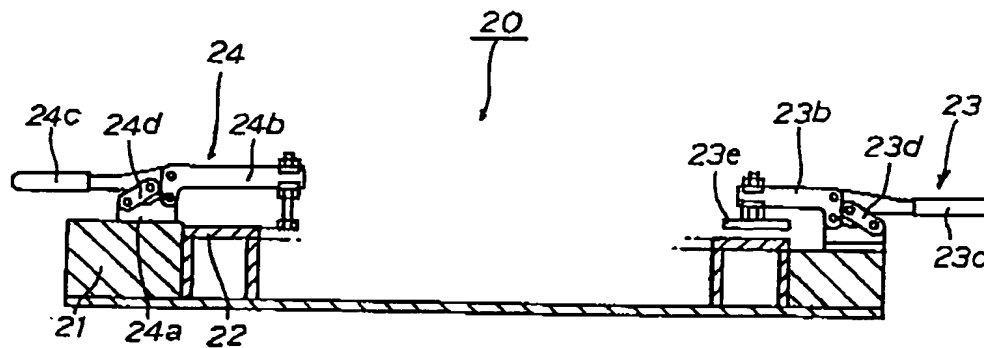


Fig.7

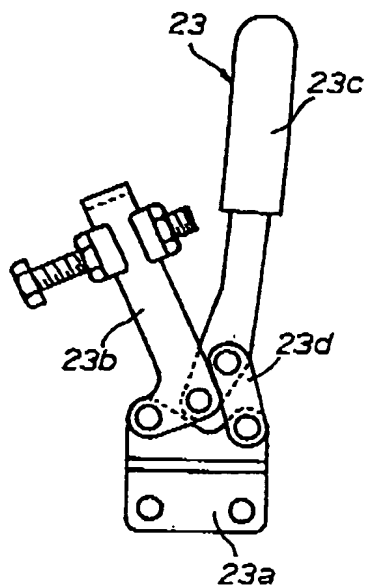




Fig. 8

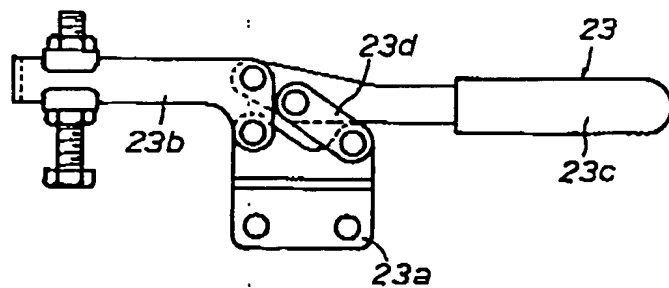


Fig. 9

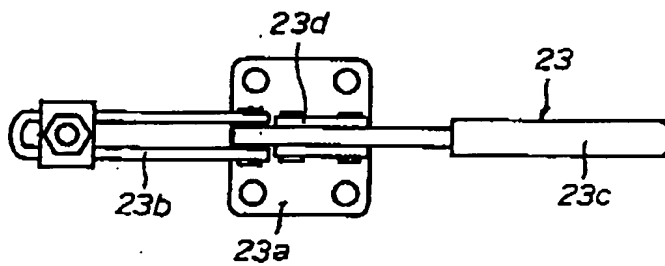




Fig.10

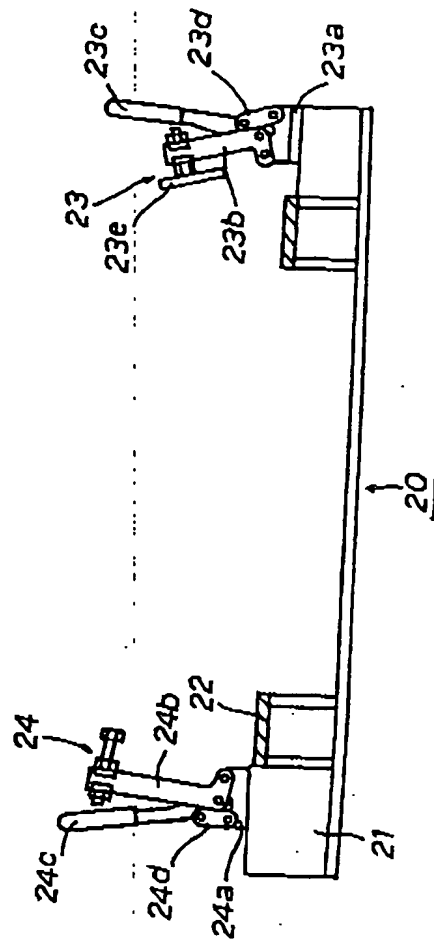




Fig. 11

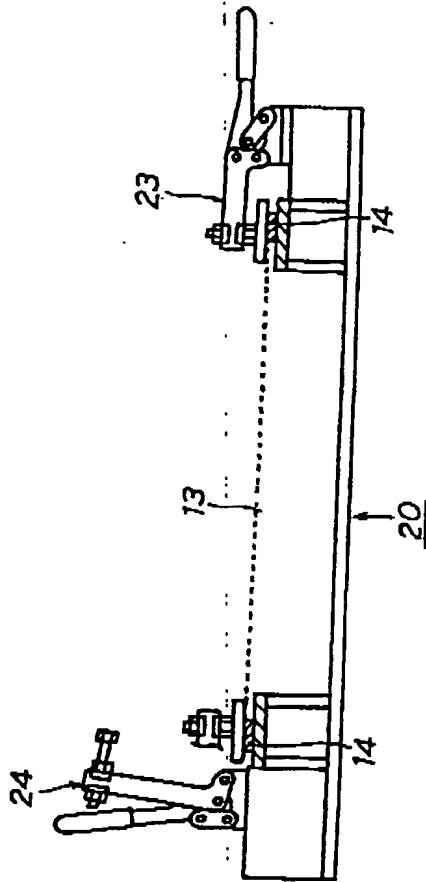


Fig.12

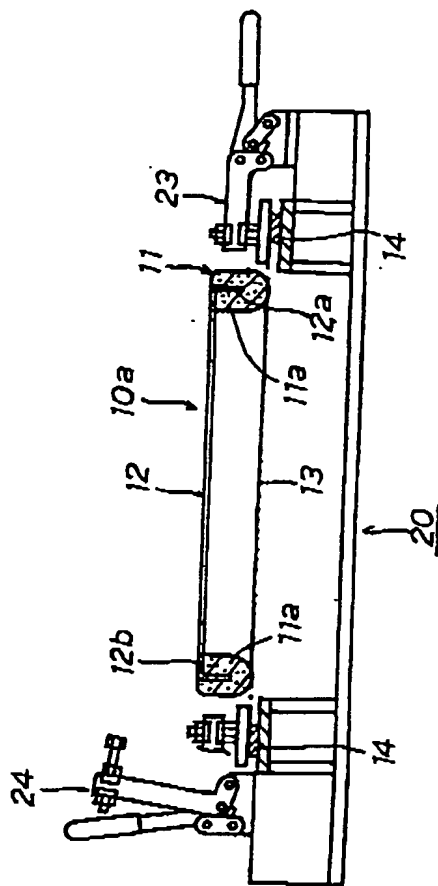




Fig.13

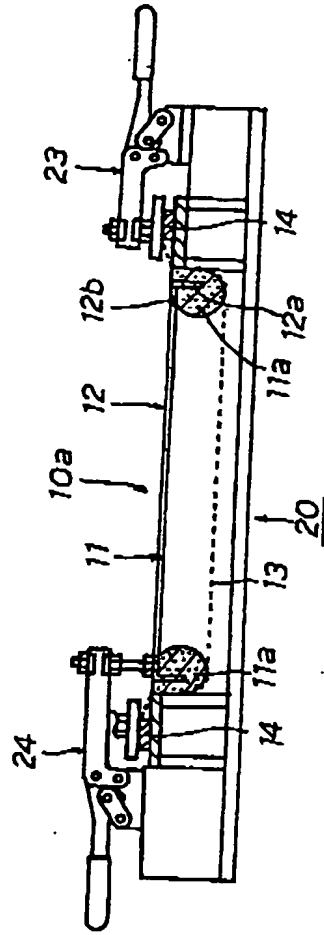
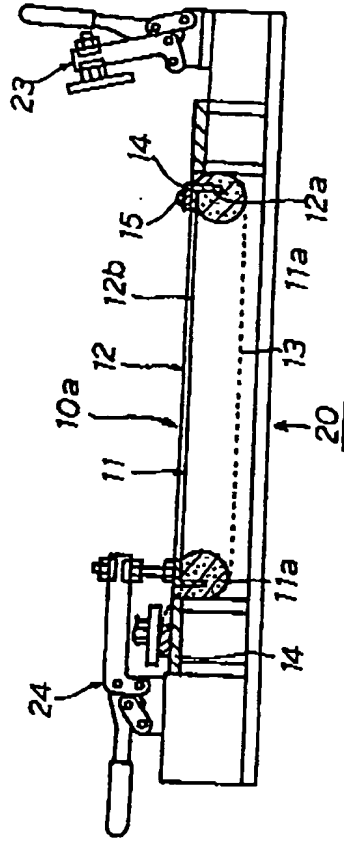


Fig. 14





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CERTIFICATION

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I, Shoichi Hase, of 35-9, Motohama-cho, Gifu-shi, Gifu-ken, 500-8007 Japan, hereby certify that I am the translator of the accompanying certified official copy of the document in respect of an application for a patent filed in Japan on the 28th December, 1999 and of the official certificate attached thereto, and certify that the following is a true and correct translation thereof to the best of my knowledge and belief.

Shoichi HASE

Dated this 2 September, 2003